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ABSTRACT

Two recent developments in computer-assisted language learning (CALL), interactive video systems and "intelligent" games, are discussed. Under the first heading, systems combining the use of a computer and video disc player are described, and Compact Discs Interactive (CDI) and Digital Video Interactive (DVI) are reviewed. The introduction of artificial intelligence in the programming of CALL is examined, allowing the user to communicate more freely with the machine within a given domain or microworld. Specific instructional techniques and approaches are described. Producers and addresses for CALL interactive videodisc systems and videodisc authoring systems are listed. The paper includes a 58-item bibliography. (MSE)

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RECENT DEVELOPMENTS IN INTERACTIVE AND COMMUNICATIVE CALL: HYPERMEDIA AND "INTELLIGENT" SYSTEMS

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Second language acquisition research is being actively pursued by scholars in the field of theoretical linguistics, psycholinguistics, English as a second language (ESL) and to a lesser extent in foreign language education. Though the nature of second language acquisition is not yet clearly understood, several linguistic methodologies have been developed in the past fifteen years which emphasize context-based or communication-based approaches (Asher, 1974; Curran, 1972; Stevick, 1982; Terrell, 1977). Further studies on the optimal use of Computer-Assisted-Language-Learning (CALL) software in the field of second or foreign language acquisition underline the need for programming based on recent pedagogical methods emphasizing interaction and communication (Baker, 1984; Paulston, 1980; Underwood, 1984).

In the late seventies CALL programs were little more than an imitation of their predecessors, the audiolingual tapes. They were patterned on drill-based methods that emphasized correct grammar use. In the past ten years CALL has come a long way, gradually switching from a form-based to a context-based approach. Today well designed CALL influenced by the research and experiments mentioned above is attempting to include some of the following elements: individualized practice, simulation of "real life" situations, playfulness and creativity, all presented in a rich cultural context. Well-conceived CALL allows each student to advance at his own rhythm, having access to meaningful practice fitted to his needs. Interactive games and authentic cultural contexts allow learners to maintain a high level of interest effortlessly. Simulations of "real-life experiences" encourage users to communicate meaningfully. Finally creative, playful programs presented in authentic settings favor acquisition in a positive atmosphere.

Two recent developments are attracting the attention of educators in the field of CALL, namely interactive video systems and "intelligent" CALL games.

Under the first heading we shall describe systems combining the use of a computer and a video disc player. We shall also review Compact Discs Interactive (CDI) and Digital

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Video Interactive (DVI) which will provide real time interactive educational programs obtained from a stand alone CD-I player.

The second part of our article will deal with the introduction of Artificial Intelligence in the programming of CALL, which will allow the user to communicate more freely with the machine within a given domain or microworld.

Presently available interactive video systems combine the use of a computer and a video disc player to present a student with life-like situations where he interacts with native speakers filmed on location in an authentic setting.

Many research institutions are in the process of developing language learning programs which combine the reading and writing skills needed in early CALL with visual and oral communication required by video-assisted instruction. The equipment needed for this type of instruction includes a micro computer and monitor hooked to a laser disc player; its total cost is approximately $7000. Hopefully, as always with computerized equipment, prices will eventually go down. Are those hypermedia systems worth their price tag? During demonstrations at professional meetings, language instructors have responded positively to the wealth of communicative possibilities and the powerful motivational elements. When interactive video systems are used, the laser disc, projected on the computer monitor, offers a very sharp color picture of native speakers in authentic looking decor. Both commercially available movies and amateur video movies can be utilized in the design of CALL.

The following list (Electric Word Sept. Oct. 1989) includes interactive video systems available to language specialists. It also includes hypermedia authoring systems used to create interactive videodiscs. Since videodisc players allow instant random access to the some 60,000 images on the disc, the designer can control its flow, slowing it down, backtracking, etc. He also can add vocabulary, written comments, help devices, etc.

1) Interactive Videodisc Systems:

Paris en Video

Educational Computing Consortium BV (ECC)
P.O. Box 217
7500 AE Enschede
The Netherlands
Tel: +31 (53) 892 190

Aims to teach French as it is spoken by the French, while getting the student acquainted with the country's culture. Can be browsed through or used as a course or database on French culture.

Télé-Douzaine

PICS
266 International Center
The University of Iowa
Iowa City, Iowa 52242
Tel: +1 (319) 335 2335

Twelve features from French Télévision. Features from Antenne 2 selected primarily to motivate elementary to intermediate level students.

ESL Videodisc with Raiders of the Lost Ark

CALI Inc.
526 East Quail Road
Orem, UT 84057
USA
Tel: +1 (801) 226 6886

The courseware consists of 13 lessons and 36 X 3 minute-long scenes from the Spielberg megamovie with hundreds of study questions. Two screen presentation. Aims to teach English as a second language. Promotes high student interest and motivation.

Vektor

BBC English
P.O. Box 76
Bush House
London WC2B 4PH
UK
Tel: +44 (1) 240 3456

The BBC collaborated with the Interactive Learning Unit of Salford University and IBM UK to produce what they claim is the first interactive videodisc program teaching spoken Business English.

Uses PC/AT/compatibles, a Laser-vision videodisc player, Videologic MIC 2000 EGA interface card, and a fast-blanking monitor such as a Sony KX14 CP1.

German Language and Culture: An Audio/Videodisc Approach

CALICO
3078 JKHB
Brigham Young University
Provo, UT 84602
USA
Tel: +1 (801) 378 7079

First commercial product from this consortium of academic, business, research, manufacturing, and government members based at Brigham Young, one of the premier centers for CALL research.

Shot on location in Heidelberg, Germany, the video/videodisc action is suitable for beginner to intermediate level students. Subjects covered include: hotels; eating out; changing money; at the German border; travel by taxi, train, tram and car; asking directions; etc.

CAV Videodisc (two sides). Price: US$195. Also available in videocassette ($90) and audio cassettes versions ($25).

Expodisc Spanish

Expodisc Office
The Buckinghamshire College
Queen Alexandra Road, High Wycombe
Bucks HP11 2JZ
UK
Tel: +44(494) 464 535

As an assistant to the export manager of a company preparing to market a product in Spain, you help prepare for the business trip and identify and contact a suitable target company.

Needs an AT/compatible, plus a Philips Laservision player. Retails at UK £950.

Annapolis Interactive Video Project

United States Naval Academy
Annapolis, MD
USA
Tel: +1(301) 267 3279

This sophisticated interactive system is one of several produced by US military academies for training their officers, and like the others, is not yet available to the

general public. AIVP says it may well be distributed next year for a nominal fee.

A la Rencontre de Philippe

Dr. Janet Murray, Director
Athena Language Learning Project
MIT, Room 20B-226
Cambridge, MA 02139
Tel: +1(617) 253-2094

Designed to expose students to spoken French of native Parisians, A la Rencontre de Philippe and its companion program will be available on the Macintosh platform for under $200 each.

2) Videodisc Authoring Systems

Videofile: Author

IDI, Inc.
distributed by CALI
526 East Quail Road
Orem, UT 84057
USA
Tel: +1 (801) 226 6886

Course Builder

TeleRobotics International, Inc.
8410 Oak Ridge Highway
Knoxville, TN 37931
USA

Course of Action

Authorware, Inc.
8400 Normandale Lake Blvd.
Suite 430
Minneapolis, MN 55437
USA

HyperCard

Apple Computer, Inc.
20525 Mariani Avenue
Cupertino, CA 95014
USA

IBM Info Window

IBM
P.O. Box 2150
Atlanta, GA 30055
USA

In well-designed hypermedia systems the menu offers a large variety of optional choices to access various parts of the program. The dialogue is entertaining and the feedback, both oral and written, is most helpful. The student watches an audiovisual sequence which he can stop at any point by pressing a computer key. At that point he can call for the repetition of an audio-visual passage at normal speed or slowed down. Other help options come from the written screen in the form of dictionary consultation and written explanations. Oral prompts consist of interactive communication between the actors on the screen and the student who becomes the hero of the story being projected on the screen. The software described here has elicited a high degree of enthusiasm because of the added interactive oral component which is sadly missing in older CALL. Other elements such as the use of authentic decor and native speakers, humorous dialogues and excellent help features make the use of such material highly attractive and informative.

The latest development in interactive technology includes Compact Disc-Interactive (CDI) and Digital Video Interactive (DVI) which are not yet commercially available and are being developed by RCA (DVI) and Philips/Sony (CD-I) which first demonstrated its full-screen, full-motion video CD-ROM application at the Microsoft Conference of March 1988. Both are first targeted at business and educational applications, but long term plans will aim at mass consumer markets.

In a couple of years CD-I discs will be available with titles such as "Let Us Visit Versailles." After inserting the disc into a new Philips, Sony or Pioneer videodisc player the size of a hi-fi amplifier, the screen will fill with the picture of the "galerie des Glaces" while music by Lulli is playing in the background. On a menu in a corner of the screen there will be two options to either stay inside or tour the gardens designed by Le Nôtre. Using a mouse or by touching the screen users will choose for instance "Let us go into the gardens." The music will fade as the camera moves down the stairs. On the next menu the choice will be between two visits narrated in French or English either to the "Grand Trianon" or along the alleys and water basins

adorned with marble, bronze and lead statues.

Such CD-I systems will provide highly sophisticated tools in the educational field both in the humanities and science. In business CD-I applications in vertical markets such as specialized training should be most lucrative. Interactive entertainment for children and adults should also be successful once the mass consumer market becomes the target. For example, Polygram is developing a CD-I program about the history of classical music including biographies of famous composers. Time Life Books are working on an adaptation of "how-to" books on photography, etc. Grolier Publishing Company is putting its Academic American Encyclopedia on CD-I.

The compact disc industry is paying fanatical attention to standardization of the whole CD concept to avoid the VHS versus Beta fiasco in the videocassette industry. Hopefully, CDs bought in Japan, Europe and the United States will be played on the same player.

Another promising development of CALL, which we shall discuss here, is the introduction of Artificial Intelligence (AI) strategies in the design of CALL. Such strategies hold exciting prospects since they should allow for greater interactivity.

AI research attempts to make computers perform cognitive tasks in all areas of human endeavor. The area of AI which is of interest to all linguists is called Natural Language Processing (NLP). Predictably "knowledge crunching" will become as important as "number crunching" has been so far, the importance of symbolic processing equaling if not surpassing that of numeric processing. Linguists may lack scientific knowledge but they possess a lifetime expertise in natural language. NLP is an exciting new field for all scholars whose expertise is grounded in the study of natural languages.

NLP strategies consist in the disambiguation of a natural language input into a form that can be used by a computer. NLP strategies include syntactic and semantic parsing and knowledge-based approaches including the consultation of expert systems. NLP also includes the use of AI programming languages such as LISP or PROLOG and inference rules as well as parallel processing and neural networks. To simplify matters in our discussion of future CALL systems here, we will limit ourselves to the review of the first three strategies mentioned above. Syntactic and semantic parsing are already familiar concepts to all linguists, and the use

of knowledge-based expert systems can easily be discussed and illustrated in the context of CALL.

Parsing, which comes from the Latin expression "pars orationis" (part of speech) is a process which combines separate symbols in a phrase into larger symbolic groupings, until a structure is established. Different parsing methods have been developed for the computer. We will discuss them briefly.

In early language programming pattern matching is used, where the parser can look for recurring patterns. Until recently pattern matching was the only parsing method used in CALL. Based on the now famous ELIZA Program (Weizenbaum) originally designed to mimic a psychiatrist-client type dialogue, all the above mentioned programs use a pattern matching parser which compares the student's input against a set of given answers. Such pattern matching programs are the forerunners of "intelligent" programs, for they cannot accept any utterance which has not been previously entered into the system, even though the entry may be entirely correct, lexically, morphologically, syntactically and semantically.

"Intelligent" systems which should be of interest to language teachers, because of their greater flexibility of use and hence greater interactivity, will allow a degree of freedom in the choice of answers. Students' entries will not simply be compared with preprogrammed ones, but will be parsed syntactically and semantically before being accepted or rejected.

We will not go here into a great deal of detail as far as syntactic parsing is concerned. Suffice it to say that such a parser will accept syntactically correct constructions which sometimes make sense and sometimes do not. A French example will illustrate the problems presented by syntactic parsing alone. Both the following answers would be parsed as being syntactically correct:

ex. Ecrivez une carte postale
Ecrivez un employé postal!

The above example illustrates the need for natural language to be analyzed at many levels. Following syntactic parsing, the student's answer is parsed semantically. The parser checks the sentence for meaning within the sentence but independently of the general context. For instance it will refuse the second example given above because the direct object of écrire can only be a thing and not a person. On

the other hand "écrivez un timbre postal" would be acceptable to the semantic parser described above and will require further examination on the part of the computer if most erroneous answers are going to be eliminated and most correct answers retained.

The next approach is knowledge-based. The system does not only rely on syntactic and semantic parsing but also has access to a knowledge base for a specific domain. For that reason most CALL instructional language games are confined to a limited subject or microworld. Project ATHENA of MIT is in the process of developing modules which are generic and will allow a variety of applications. Within those modules, the system analyzes the microworld around it using a knowledge-based approach and is entirely independent from the language-specific rules concerning lexicon, morphology and syntax of the languages (Russian, Spanish, French, German, English) included in the project. Such microworlds, at this point, are confined to one location or one scenario, such as a room or a search for a lost object. The first implementation of such a module, called LINGO, involves a conversation with an imp about messing up a room. A more ambitious project by the MIT researchers named ENTREZ DANS PARIS is a video disc-based exercise in which a student searches for an apartment and talks with shopkeepers and residents of the 4th arrondissement (Murray, Furstenberg, Kramsch, Morgenstern 1987).

Several other projects for the development of intelligent CALL games for language learning are underway. One project called "The Foreign Language Adventure Game" (Culley, Mulford and Milbury Steen 1986) has been funded by the United States Department of Education. The project, conducted at the University of Delaware includes two adventure games, one in Latin and one in French, which are not yet fully functional. Based on the state-of-the-art in commercial adventure games, the Infocom Series (Lebling et al., 1979; Banks and Galley 1980), the Latin and French games borrow from Infocom its inventive stories and its AI applications achievements. The authors of "The Foreign Language Adventure Game" faced the challenge of retaining the excitement of the Infocom Series (See Zork, Blank and Galley 1980) while designing a pedagogically sound version for foreign language learners. Their biggest challenge was to design a robust semantic-syntactic parser which would not only accept ill-formed input but would offer helpful corrections.

Example:

Player: entrez la chateau
Program: entrez dans le chateau?
Player: Demandez le chien te mener à le jardin
Program: Demandez au chien de vous mener au jardin?

Modules and prototypes of the above described game were demonstrated at the CALICO Conference of 1986 and tested during the 1986-1987 summer workshops at the University of Delaware in 1986 and 1987.

As far as foreign language teachers are concerned the most exciting prediction by the above mentioned authors is the development of a game "shell": "It does not seem an impossible goal, though it will take many iterations of fine-tuning, to provide language teachers with a game "shell" containing a generous set of main verbs with their syntactic and semantic apparatus complete, and to allow teachers and their classes to build within this shell the imaginary world of their choice." (Culley et al., 1986)

Both the MIT and the University of Delaware projects are scheduled to be released in the early nineties.

Yet another project, PROLOG SPION 1988 developed for German has been tested with positive results on a small group of third year German students at Miami University.

Hopefully our review of intelligent CALL programs has underlined, on the one hand, their considerable potential as highly interactive tools. On the other hand, it has attempted to delineate the formidable obstacles encountered by symbolic processing and the attempts by the computer to decipher natural language. In contrast with commercial adventure games which accept incorrect grammar, CALL games have to be programmed to offer helpful corrections of ill-formed input. In the beginning CALL games, limited to pattern matching, only accepted a very limited number of inputs within a strictly prearranged setting. Gradually, with the introduction of NLP, CALL software promises to become more "intelligent" in allowing the user to communicate relatively freely within a limited subject domain such as a restaurant, a drugstore or a hospital. The most exciting aspect of CALL development, however, lies ahead of us, when generic modules developed for the exploration of various subject domains will allow the explorer of French culture and civilization to visit, at his leisure, the Musée d'Orsay where he will discover his favorite impressionist painters or go to the Palais

Brognard, rue Vivienne, to familiarize himself with the functioning of the French Stock Exchange at "La Bourse".

Beyond the development of intelligent instructional games which are highly motivational, AI offers the prospect of truly individualized CALL lessons. Besides being motivational and interactive, carefully designed CALL is known for allowing individualized learning. Each student advances at his own rhythm, and has access to practice and explanations fitted to his needs. With the advent of NLP to analyze learner's response, the program should not only be able to offer an array of options available to the student but should actually suggest the best path for the user to choose through the courseware, based on an intelligent analysis and evaluation of his current needs.

To conclude, it should be noted that future CALL technology will in most cases entwine the technologies developed for hypermedia and intelligent systems. Such a union will produce offspring which present the advantage of real time full motion picture along with the "intelligent" analysis of students' responses.

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